

form some idea rather than any estimate. In the high level bridge of Newcastle, the quantity of masonry, in piers and in land arches, approaches, &c. in 681,609 cubic feet, and the cost of that masonry was 120,000*l*. I find this to be about 3*s*. 6*d*., let us say 3*s*. 6*d*., per cubic foot, and if estimated by the cost of labour, and the greater difficulty in the transport of material, I doubt whether the old Romans could do it for less. In those magnificent substructions of the Via Appia near Ariccia, we have found by measurement (taking the whole mass) about 234,000 cubic feet. Now the internal mass in all cases was, to use a Vitruvian term, *ad emptionem*, or as we might call it, rubble: making all due allowance for this, I should not have in the Valley of Ariccia, reckoning the stone-work 5 feet on each flank, more than 100,000 cubic feet, i. e. reckoning at 3*s*. 6*d*. per cubic foot, about 17,000*l*. worth of real masonry; and this in the tenth part of a mile. In the whole length of the 142 miles to Capua, we do not find more than two other extra works, viz. at Terracina and at Fondi; so that the cost of the Via Appia would not probably exceed 32,000*l*. (the average price of a mile of our railway) above the ordinary expenditure of making a common road. I confess this is a vague calculation, if even it can be called one; but if it should be raised to the utmost stretch of imagination, it would be insignificant as to pounds sterling, by the side of our leviathan railroads. The following I have on good authority, as the average cost of a mile of railway throughout Great Britain: the cost being of course very unequal in different places:—

Land .....	25,000
Earth Work .....	5,000
Tunnelling .....	3,000
Masonry .....	3,000 ordinary line
Viaduct and Large Bridges .....	5,000
Permanent Iron Road .....	5,000
Stations .....	4,000
Low Expenses, Engineering, Surveying, &c. ....	3,000
	232,000

If this be multiplied by 5,000, which is the aggregate distance of British railways, we have the almost fabulous amount of 160 millions, a sum fully equal to ten times the revenue of all the Roman provinces in the time of Augustus. I have spoken of 234,000 cubic feet of masonry and rubble as contained in one of the great works of the Via Appia: the high level bridge at Newcastle alone, as we have seen, contains of masonry 681,609; of rubble, 116,396; of concrete, 46,224; total, 844,229; besides 5,050 tons of iron, of which the Romans knew nothing. The whole cost of this undertaking was 234,450*l*. The cubic feet of masonry in the Britannia-bridge, which we must consider as a viaduct, and the wonder of the present age, is 1,500,000; and the cost, approximately calculated by Mr. Edwin Clarke, was 601,865*l*. The cost of the Conway-bridge, with 38,500*l*. worth of masonry, was 145,190*l*. And, finally, the Tweed Viaduct is said to contain two million cubic feet of masonry. We have, then, in these four great works alone—the Britannia and Conway Bridges, the Newcastle and Berwick Viaducts or bridges—near four millions and a half of cubic feet of masonry; the whole costing not less than 1,280,000*l*. That is to say, if we could find in the Roman empire one hundred such works as the celebrated substruction of the Via Appia, they would hardly equal in masonry or stone-work these four productions of the “ultima Britannia:” this is independent of such material as the ancient Romans could not procure, and for which we must not charge them:—9,420 tons of iron were employed in the Britannia-bridge, and 5,050, as I have said, in the high level bridge of Newcastle. It is probable that whole armies worked at the Roman roads, bridges, and viaducts, and it would not be fair to compare their mechanical apparatus with the scientific inventions of modern times; but it may be doubted whether they ever presented such a union of physical power as was seen one day on the Menai Straits, when 650 men were employed in raising the second tube of the great bridge, of whom 386 were sailors; and although, as I have said, we have but little or no data to go upon for making a comparison

of expenditure and labour, yet we may gather enough to maintain the proposition, that all the great works of the Roman Empire connected with their lines of communication did not equal the works of a similar kind which now exist in the Island of Britannia. Another thing which hinders us from making comparisons as to cost: we have in every line of railway 6,000*l*. per mile for land: Appian Claudius cut through the country of the Volsci without asking the price, and dispensed with all juries for assessing damages. The “*mutationes*” (hovels where they changed horses) were all the stations that occurred on their line: the comforts of law expenses were not known; and I doubt much if the surveyors and engineers got 1,200*l*. a mile. I wish I could have found how many sesteria Trajan paid for his restoration of the Via Appia, but all the data I have to guide me in the calculation of that expenditure are, that Trajan paved the road out of his own money; *de sua pecunia stravit*: this, however, is more than can be said for many of the projectors of our modern railways, *de aliud pecunia ferro straverunt*, i. e. they laid down the iron with other people's money,\* might be a more appropriate inscription. When Augustus remade the Flaminian way to Rimini, he was the sole shareholder, and gave no scrip. Julius Caesar and Marc Antony raised great works, but they knew nothing about raising dividends; but that which would have astounded them more than irruption of barbarians, would have been a bill of 1,800*l*. for every mile of road for parliamentary and law expenses: if this be a true average, and I have authority for stating that it is, then we may deduct from the cost of 3,740 miles of Roman road, which led from Scotland to Jerusalem, the sum of 6,732,000*l*.; and if these worthless of old time had been called upon to make 5,000 miles of road in the provinces of Britain, they might have economised thirty millions of our money by paying nothing for land. In estimating the value of a Roman road, therefore, we have to deduct 7,800*l*. a mile for land and law, and 4,000*l*. for stations, and 5,000*l*. for iron, before we come to the materials they were enabled to use: in other words, the materials of the Roman road and labour would not be more than half the cost of our railways, from the mere fact of certain expenses being absent which they could not understand; but, although inferior to the Britons of the nineteenth century in the art of spending money, if judged by the present state of the science, they could not be despicable engineers: their levels were chosen on different principles, but their lines of road passed through the same countries, and generally in the same direction as our railways. There is a diagram in an article in the *Quarterly Review*, written seven years ago, which exhibits a general view of the direction of the principal Roman roads in England: comparing one or two of our principal lines, we shall find that the Great Western, e. g., supplies the place, with a little deviation near Reading, of the Roman iter from London to Bath and Bristol: the Liverpool and Manchester, and on to Leeds and York, replace the Northern Watling-street: the Eastern Counties follows a Roman way, and so of the rest.

In boasting of the gigantic steps which the art of road-making has taken in our time, we cannot afford to depreciate either the genius, or the magnificence of the ancient Romans in this matter. If we have our railway under the cliffs of Dover, Trajan had his road under 2,000 feet of perpendicular cliff along the latter: if we have our 5,000 miles of rails, the Romans had their 4,000 miles of chosen road, reaching from one extremity of the empire to the other: if we have our leviathan bridges and viaducts, the Romans had theirs over greater rivers and wider vales than we have to deal with; and finally, if we have our glass bazaar, one-third of a mile long in the park, they had a golden palace, which reached a whole mile on the Esquiline hill. If we rise superior and look down upon the works of the Romans, it is not so much that we have gained

\* Or, “they laid down the iron with other people's tin.”—*FAIRY, DEV.*

in unskilful labour, as in science. Without the iron and the science, their works would be as great as ours: it is in mental rather than in any physical energies, that we have the pre-eminence: it is what our last great poet has called the “divine particle,” which has been dilated by Him who gave it to man, that has enabled us to cope with the very elements, and wing our way against wind and tide over oceans and seas unknown to the ancients: the spirit of a man which is in him is capable of knowing the things of a man, and this capability it is the business of all associated bodies to foster and draw out. It is not, perhaps, yet known of what the human thought is still capable, but the blessing of every discovery in art or science which procures fresh enjoyment for man is, that it brings brute force to a discount, and teaches to mankind the lesson of fraternity and peace; and it is not, perhaps, too much to say, that this question of roads, by which all nations of the earth are brought within the possibility of meeting again on some plain of Shinar, is calculated more than any other human instrument to renew the face of the earth. I fear, gentlemen, that this dissertation is wide of the mark for a paper that is read in an Institute of Architects, and did I not know that this Institute shelters all collateral branches of the art, and encourages amateurs to make experiments, I should be apprehensive that, whatever I may have said upon roads new and roads old, I have not hit upon the road to preferment in your estimation. I can only say, by way of connecting my subject with your unpressive and beautiful art, that whenever you are called upon to erect an edifice, say a church, in architectural beauty, forget not to consider well the approachers: then you will not regret to have known of my *rudus*, and *fatucationes*, and *opus stratum*, especially if you work in clayey soils; all which you will find necessary in constructing a road which shall lead up and not down to the temple you have erected. Finally, I never feel out of my element when I am contributing to promote those studies which refine the mind, and which, by increasing the comforts and rational enjoyments of our fellow-creatures, cannot fail of directing every well-regulated mind to the great Author and Giver of all good things, and of glorifying Him who hath given such power unto man.

RICHARD BURGESS, B.D.

#### THE NEW HOUSE OF COMMONS.

THE House of Commons has been remodelled, and is now completed, ready for occupation. The acoustic effect of the changes has been but partially tried as yet. We sincerely hope that a fair chance will be given to it, and that it will prove satisfactory. The ceiling has been brought down 5 or 6 feet in the centre, and instead of being flat over the whole expanse, as before, is sloped down on all sides. The upper half of the windows, which formerly had a central transom, is thereby put out of sight, and as this lessened the light considerably, the sills have been cut down about a foot.

The side galleries have been made wider, and are covered beneath, to throw out the sound (we should not advise speakers to stand under them, nevertheless). A very considerable increase of accommodation has been gained in the division lobbies by the addition of one large and two small oriel. The gallery for the public has been enlarged, and accommodation is now afforded for about 460 members. Retiring rooms, too, have been provided above the division rooms. The reporters' gallery, at the Speaker's end, is so arranged, temporarily, that each reporter has a separate stall, with a door at his back; so that he is able to come and go rapidly, and without disturbing any other. They have a private staircase and two retiring rooms, with desks, where they may arrange their notes or refer to books and papers. The ceiling of the House is wholly of oak; and the panels have slight coloured decorations. The small shields in the wainscoting and in the front of the gallery are left plain, with the exception of three or four, which are emblazoned with arms of towns, as specimens of what Mr.